

REVISION OF THE GHOST MOTHS  
(LEPIDOPTERA HOMONEURA, FAMILY HEPIALIDAE)

PART VI

By NORMAN B. TINDALE, B.Sc., SOUTH AUSTRALIAN MUSEUM

Plate xxvi-xxxii and text fig. 1-25

INTRODUCTION

PART V of this Revision was published in these Records, in vol. vii, 1942, pp. 151-168. The long delay in the appearance of this part was forced by six years of interruption during World War II followed by pressure of other work. Parts VII and VIII are now in preparation.

Since 1942 three other short papers, not in the series, but dealing with Hepialidae, have been published by the present author, namely, in Ann. Mag. Nat. Hist., London, ser. 12, vii, 1954, pp. 13-15 and plate; Trans. Roy. Soc. S. Aust., Adelaide, 76, 1953, pp. 77-79 and plate; Proc. Ent. Soc. Washington, 47, 1945, pp. 183-184. One earlier paper, in the South Australian Naturalist, Adelaide, 20, 1938, pp. 1-6 and plate, dealing with the life-histories of some Australian Hepialids, has not been mentioned among previous bibliographic references.

A supposed ancestral Homoneurous insect fossil was described by the author in the Proceedings of the Royal Society of Queensland, 56, 1945, pp. 37-46, as *Eoses triassica*, from the fossil insect beds of Triassic Age at Mt. Crosby, Queensland.

As already mentioned by name in previous parts of this Revision, thanks are due to many who have assisted in the studies by loan of material, etc. As the material is worked type specimens are being returned, requests being made for paratype material for the South Australian Museum collection when these are available.

Genus OXYCANUS

Australian members of this genus were discussed in Part III of the Revision; in the present account the New Guinea species are described and some additions and corrections are made to the earlier paper.

Previously eight valid species of *Oxycanus* had been recorded from New Guinea. An additional 15 are described and figured herein.

As in the case of the Australian ones, the study of the species of *Oxycaenus* from New Guinea has presented no little difficulty because of the great variability of the wing markings, which in any given species may tend to run the gamut from an almost unmarked light-coloured phase, through light and dark-fasciate, and silver-spotted forms to several distinctly melanic ones. In the study and confirmation of the relationships of the Australian species long series of specimens, including intergrades between the forms, usually were available. The New Guinea species are in general relatively scantily represented in collections, hence in making some estimates of specific distinctness, experience gained in handling Australian material has had to be relied on to make up for the limited available series.

After study of the major part of the extant material it seems that the only dependable characters for specific separations are evident in the male genitalia, but times of appearance and altitude are also useful indicators. As in the Australian forms, most of the New Guinea species have limited emergence periods and their habitats also are altitudinally (hence climatically) delimited, so that, for example, a species emerging in July is in general separable from one occurring in, say, November, and one occurring at, say, 1,500 metres is not likely to be present also near sea level.

Unfortunately these seeming facts have tended to be overlooked in the past and they often run counter to earlier cabinet identifications, which often have tended to equate, say, silver-spotted forms of more than one species as one, while giving a different name in common to groups of melanic examples of more than one other species.

Unless otherwise specified, the camera-lucida sketches of genitalia illustrating this paper were drawn from two aspects, without removal of the parts, and are intended to give as much information as possible regarding the hard parts and marginal contours of the tegumen, the apices of the harpes and the shape and general size of the 8th sternite. In these sketches the body form is generalised and no allowance could be made for post-mortem changes, etc. In general, the form of the tegumen is constant for each species; the principal variations are in the number and relative sizes of the smaller spines along the tegumen; in several instances such minor differences are evident as asymmetries in the drawings.

Since this revision was ready for press, a paper by Viette (1950) has become available. In it is a proposal that some New Guinea members of this group should be placed in a separate genus *Puraoxycaenus*.

Some of the material upon which this Revision is based already has been

distributed, hence a comprehensive check is not possible, but, on the available material, it would seem probable that at most *Paraoxyzanus* is a valid subgeneric division which can be used for *O. novaeguineensis* and its allies. However, the advisability of using strictly genitalia characters even for subgeneric separation is also one on which there may be legitimate doubts.

The separation of a Papuan sub-region is a relatively recent episode of zoological history—hence it is not often possible to establish clear-cut generic separations in forms from this area, and it will be noticed that, in the body of this paper, there are several instances where direct comparisons are made even between New Guinea species and the more archaic forms preserved in, for example, South-Western Australia.

The case of *Paraoxyzanus* may be parallel with that encountered in the genus *Oncopera*, where an essentially northern series of species were placed in the sub-genus *Paroncopera*, but the separation cannot be defined by clear-cut characters.

#### KEY TO THE NEW GUINEA SPECIES OF *OXYZANUS*

(based principally on male genitalia)

1. Male genitalia with teguminal margin not armed with spines .....	<i>fuliginosa</i>
Male genitalia with teguminal margin armed with spines .....	2
2. Margin with main armature of seriate spines .....	3
Margin with main armature not of seriate spines .....	11
3. Spines on nearly full length of tegumen .....	4
Spines only on posterior half of tegumen .....	<i>rileyi</i>
4. Posterior margin of 8th sternite convex .....	5
Posterior margin of 8th sternite not convex .....	7
5. Teguminal contour rather even .....	<i>postflavida</i>
Teguminal contour markedly uneven .....	6
6. Apex of forewings subfalcate, size large .....	<i>tamsi</i>
Apex of forewings rounded, size small .....	<i>zvis</i>
7. Posterior margin of 8th sternite concave .....	8
Posterior margin of 8th sternite not concave .....	<i>dives</i>
8. Serrations of tegumen irregular in size and spacing .....	9
Serrations of tegumen regular in size and spacing .....	10
9. Harpe with apex not dilated .....	<i>subochracea</i>
Harpe with apex dilated .....	<i>hecabe</i>
10. Harpe bent over at apex .....	<i>hecabe</i> f. <i>lethe</i>
Harpe not bent over at apex .....	<i>serratus</i>
11. Tegumen with large process, or spine, in anterior third .....	12
Tegumen with large process, or spine, at or near middle .....	16
12. Posterior half of tegumen with seriate spines .....	13
Posterior half of tegumen with irregularly spined process .....	<i>thusus</i>
13. Anterior process of tegumen with more than one tip .....	<i>salmonacea</i>
Anterior process of tegumen with a single tip .....	14

14.	Anterior process of tegumen not strongly bent over at tip	.....	<i>nigripuncta</i>
	Anterior process of tegumen strongly bent over at tip	.....	15
15.	Anterior process of tegumen pointed vertically downwards	.....	<i>thoe</i>
	Anterior process of tegumen pointed obliquely forwards	.....	<i>albostrigata</i>
16.	Anterior half of tegumen with seriate spines	.....	<i>atrox</i>
	Anterior half of tegumen not armed with seriate spines	.....	17
17.	Median process of tegumen only a simple pointed spine	.....	<i>eos</i>
	Median process not a simple pointed spine	.....	18
18.	Median process other than a plate-like expansion	.....	19
	Median process a plate-like expansion	.....	20
19.	Median process a broad digitiform lobe	.....	<i>perplexus</i>
	Median process a slender digitiform lobe	.....	<i>meekei</i>
20.	Median process anteriorly directed	.....	<i>mayri</i>
	Median process posteriorly directed	.....	21
21.	Harpes slender and inflated at tip	.....	<i>discipennis</i>
	Harpes of normal form	.....	<i>hebe</i>

OXYCANUS FULIGINOSA (Rothschild)

Plate xxix, fig. 6 and text fig. 1

*Porina fuliginosa* Rothschild 1916, *Lepidoptera of Brit. Ornithol. Union Exped. to New Guinea*, 2, No. 15, p. 145.

Male. Antennae reddish-ochreous, slender, short, moderately pectinate with whorls of hairs. Head and thorax dark sooty brown, abdomen grayish-brown. Forewings rather uniformly dark sooty brown, roughly scaled, with traces of long yellowish hair-like scales along costa; there is a transverse series of ochreous-fuscous marginal spots, one between each vein from  $\frac{1}{2}$  costa running parallel to termen and reaching inner margin just beyond one-half (in the holotype male these are slightly more evident with traces of two additional ones on discocellulars). Hindwing gray with the base only of the wing clothed in yellow-tinged hairs; hairs near inner margin darker than elsewhere. Forewing length 19 mm., expanse 42 mm.

*Loc.* New Guinea: Carstenz Peak, Utaikwa River, 5,000-10,000 feet, February to March, 1913, A. F. R. Wollaston. Type, probably a male, in British Museum (ex Tring), also a paratype male. The type was described as a female but appears to be (without critical examination of the genitalia) a male.

The example available for detailed study is the rather worn paratype male, but a photograph of the type (pl. xxix fig. 6) is available. The figure shows the rather characteristically rounded wings, with reduced vannal area of hindwings, a rather obscure series of markings across the forewings, and the hairy clothing.

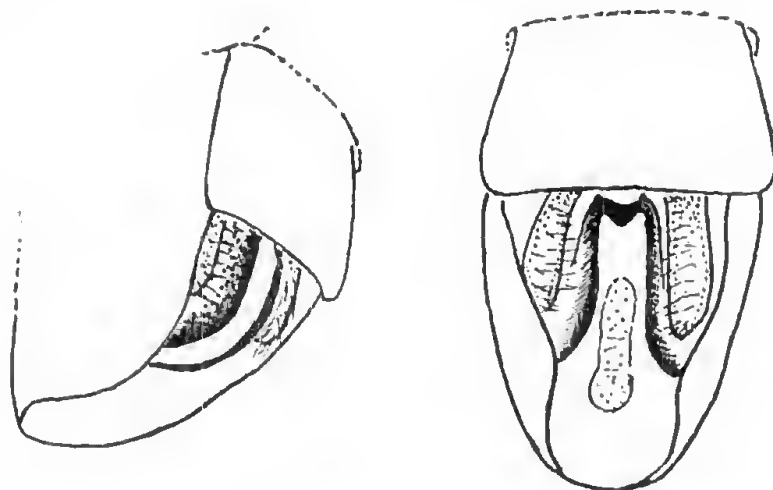


Fig. 1. *Oxycanus fuliginosa* (Rothschild), Carstensz Peak, male genitalia of paratype, oblique lateral and ventral views.

The genitalia (text fig. 1) have the tegumen entirely unarmed, presenting an even convex outline, when seen in lateral view.

This species is not close to any other known one, which is perhaps to be expected from its presence at such a relatively high altitude on a tropical mountain. The form of the genitalia may hint at relationship with the rather isolated *O. perditus* from South Western Australia, which likewise shows a tendency to reduction of the vannal area of hindwing. It is of interest to speculate that these two peripheral species may represent relict forms of a very early differentiation of the *Oxycanus* stock.

#### OXYCANUS RILEYI sp. nov.

Plate xxvi, fig. 1 and text fig. 2

Male. Head with antennal segments ochreous, segments transversely keeled, with whorls of fine hairs; head and thorax grayish-brown, abdomen pale gray. Forewings dark brown with tinges of ochreous brown in anterior part of disc; a broad creamy-white flash from base to termen, crossed by about eight transverse rows of silvery-white spots, each spot ringed with dark brown, cilia on termen cream, on inner margin grayish-brown. Hindwings gray with a tinge of ochreous-yellow towards termen. Forewings below gray with traces of the cream flash and the white spots. Hindwings below tinged ochreous yellow, the colour stronger along costa. Wing length 30 mm., expanse 65 mm.

*Loc.* New Guinea: Nomnagihé, 25 miles south of Wangaar, 2,000 feet January to February, 1921, collected by C., F. and J. Pratt. Type in British Museum (Joiecy Coll., 1929-122).

Only a single example has been examined of this most distinctive species. It seems rather out of place among the New Guinea species and to fall more with *O. poeticus* of South Western Australia and with *O. stellans* of Victoria. This relationship may be real, though remote. However, the form of the tegumen is different, so that in a classification based on form of genitalia alone it would fall into a quite separate group, not very close to any other.

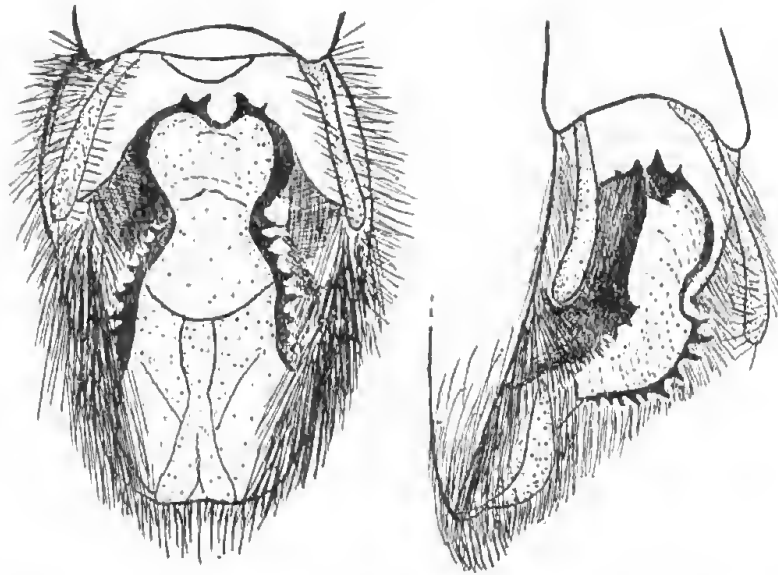


Fig. 2. *Ozycanus rileyi* Tindale, Nomnagihé, 25 miles south of Wanguar, male genitalia, ventral and oblique lateral views.

The male genitalia (fig. 2), so far as they may be seen in the type without dissection, have the eighth sternite with posterior margin evenly concave; there is a long and slender harpe, and the tegumen, viewed from the side, shows anteriorly a pair of forwardly directed spines; the anterior half of the margin is unarmed and the posterior half well armed with about ten seriate spines. I have pleasure in associating with this species the name of Mr. N. D. Riley, to whom I am much indebted for opportunities to study material from the British Museum.

#### OXYCANUS POSTFLAVIDA (Rothschild)

Plate xxix, fig. 5 and text fig. 3

*Porina postflavida* Rothschild, 1915, *Lepidoptera of British Ornith. Union Exped. to New Guinea*, p. 145.

"Male. Antennae brown; head and thorax blackish-chocolate; abdomen buff. Forewing blackish-chocolate with four transverse rows of dull orange

fulvous rings. Hindwing semihyaline buff, nervures and margins broadly orange." Forewing length 25 mm., expanse 55 mm.

*Loc.* New Guinea: Carstensz Peak, 5,000-10,000 feet, February to March, 1913, A. F. R. Wollaston. Type, unique, in British Museum (ex Tring).

The antennae in this species are relatively long, nearly one-fourth the length of forewing and each segment is surrounded by a complete ring of hairs; the palpi are very short and concealed in the dense hairy clothing of face.

The genitalia, so far as they could be observed in the type, are shown in free-hand sketches (fig. 3). The posterior margin of the 8th sternite is convex and the tegumen, viewed from the side, is seen to be arched and well armed, with

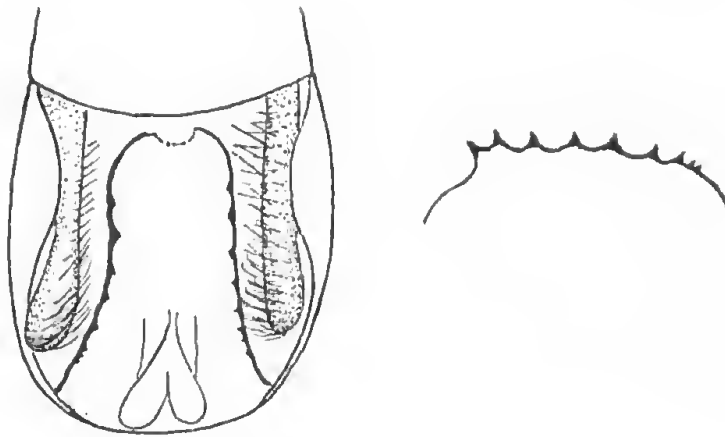


Fig. 3. *Oxycanus postflavida* (Rothschild), Carstensz Peak; freehand sketches of male genitalia of type; left, ventral view; right, silhouette of right tegumen as viewed from right side.

seven large spines, followed by two small ones. In the general form of the genitalia this species is nearest to *O. tamsi* from Mt. Goliath, this also is a species from a moderately high altitude, emerging at about the same time of the year. However, the shape and markings of the wings, as well as details of the genitalia are quite different, it being noted that the spines of *O. postflavida* are more acutely pointed and rather more evenly dispersed along the margin of the tegumen, the right and left sides of which appear more widely separated.

#### OXYCANUS TAMSI sp. nov.

Plate xxvii, fig. 1-3 and text fig. 4

Male. Antennae dark ochreous, short, stout, tapered. Head and thorax pale brown, abdomen ochreous, slightly darker at apex. Forewing bright ochreous with a dusting of fine black and brown scales; costa, a band from near costa at  $\frac{3}{4}$  to inner margin at  $\frac{2}{3}$ , and blotches surrounding small black spots near

termen grayish-brown, and showing a faint violaceous bloom; at the costa itself the transverse band is grayish-white; there is a black blotch in the discoidal area and a series of black margined silvery-white discoidal spots, also some additional subterminal marks just beyond the grayish transverse band. Hindwings bright ochreous, the dense hair near base appears slightly darker. Wings beneath rather uniformly ochreous, without markings. Forewing length 38 mm., expanse 83 mm.

*Loc.* New Guinea: Mt. Goliath, 5,000-7,000 feet, February, 1911 (A. S. Meek); type, a male in British Museum (ex Tring); also fourteen paratypes taken in January and February.

Like many of its congeners this species is variable in colour and markings. The type example (plate xxvii, fig. 1) is representative of a bright ochreous, silver-spotted phase; a further example (plate xxvii, fig. 3), also taken in

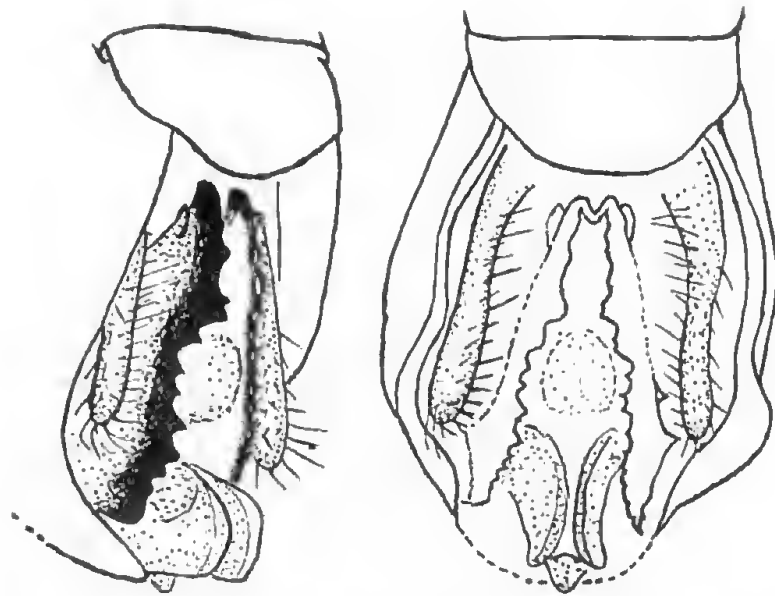


Fig. 4. *Oxycanus tamsi* Tindale, Mt. Goliath, January, genitalia of paratype male, oblique lateral and ventral views.

February, represents a darker form with the silvery-white spots remaining only as dark marks and the slightly violaceous grayish-brown bands somewhat extended. A third example (plate xxvii, fig. 2), taken in January, is an intermediate form. In the almost pointed forewings this species stands a little apart from the other New Guinea species, and at first sight it bears a superficial resemblance to some examples of the genus *Phassodes*, from Fiji. Of Australian species it might bear some relationship to *O. beltistus* and its allies, which share a somewhat similar type of genital armature, but the rather peculiarly shaped



hindwings, which are characteristic of several other New Guinea species, may suggest that the relationship with Australian forms is no closer than with several other New Guinea species.

The male genitalia have the 8th sternite with hind margin strongly convex; the harpes are relatively long and slender; the tegumen, viewed obliquely, is strongly and bluntly serrated, with the silhouette not markedly irregular save for the slight elevation of the spines immediately before the middle, followed by a series of slightly depressed ones (fig. 4).

The name chosen for this interesting species is that of Mr. W. H. T. Tams, to whom I am indebted for much hidden help in checking details on specimens in the British Museum.

*OXYCANUS XOIS* sp. nov.

Plate xxix, fig. 1-2 and text fig. 5

Male. Antennae dark ochreous, short, relatively thick-set; head and thorax dull brown, abdomen ochreous fawn, apex a little more ochreous. Forewings brown with ochreous-brown patches surrounding black spots some of which show traces of an ochreous centre; a more or less connected series of black marks from

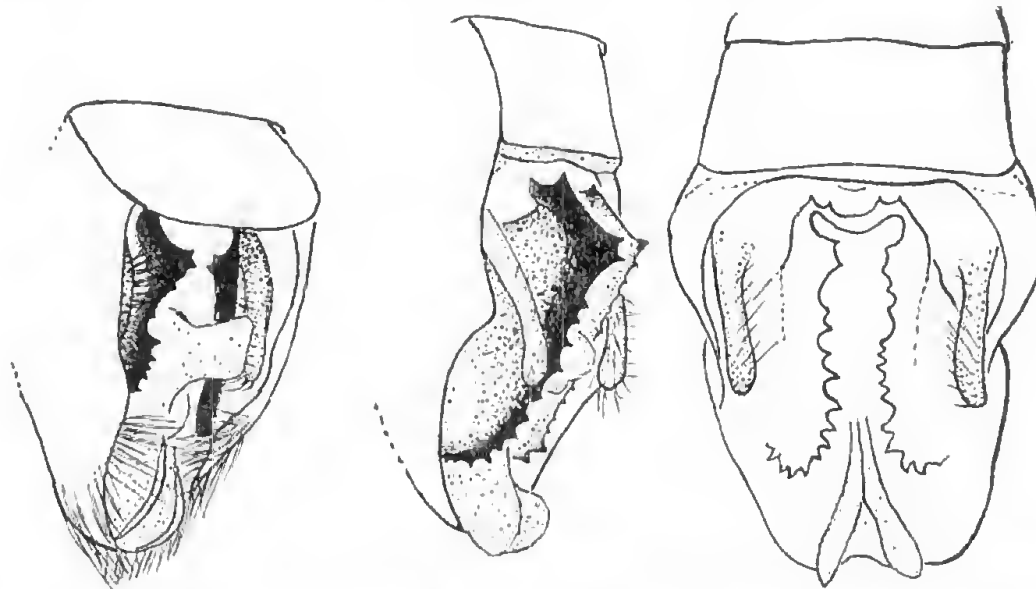


Fig. 5-6. Fig. 5 (left). *Oxycanus xois* Tindale, Dohunsehik, Arfak Mts., male genitalia, oblique view. Fig. 6 (right). *Oxycanus divex* Tindale, Mt. Kunupi, male genitalia, oblique lateral and ventral views.

near costa at two-thirds obliquely to disc, thence to inner margin at one-half. Hindwings ochreous fawn, the down at base of wing appears lighter, termen narrowly, and veins ochreous. Wings below ochreous fawn with the markings above repeated as traces. Forewing length 23 mm., expanse 50 mm.

*Loc.* New Guinea: Dohunsehik, Arfak Mountains, 1,400 metres. June, 1928, Dr. E. Mayr; type, a male in British Museum (ex Tring); a second specimen is from Angi Lakes, Arfak, 1,800 metres, June, 1928, Dr. E. Mayr.

This is one of the smaller species of New Guinea *Oxycanus*; it is not very close to any other.

The genitalia of the male present rounded posterior margin to the 8th sternite, a strongly spined tegumen, elevated with a pair of spines in the anterior third and a median excavated area (fig. 5).

In the well-rounded shape of the wings this species falls close to *O. fuliginosa*, but the apex of the forewings is not as rounded and the armature of the tegumen places it far closer to *O. tamsi* from Mt. Goliath; from that species it differs markedly in the abundantly spotted forewings, as well as in details of the genitalia.

OXYCANUS DIVES sp. nov.

Plate xxviii, fig. 1-4 and text fig. 6

Male. Antennae ochreous, well developed; head and eyes large, dark brown, thorax and abdomen somewhat paler, base of abdomen slightly ochreous. Forewings with costa and inner margin pale grayish-brown, rest of wing generally chocolate-brown with ochreous scales near costa towards apex, near inner angle, and partly margining otherwise black outlined silvery-white spots in discal area. Hindwings dull ochreous, brighter towards termen. Wing below obscurely ochreous. Forewing length 37 mm., expanse 81 mm.

*Loc.* New Guinea: Mt. Kunupi, Menoo Valley, Weyland Mts., 6,000 feet, November to December, 1920 (C., F. and J. Pratt), type in British Museum; also thirty paratypes with same details and one marked, December, 1920, to January, 1921.

This species presents a wide range of variation. Of the colour phases a dark form has been described and figured as typical (plate xxviii, fig. 1). Among notable variants there is an ochreous-brown-spotted form (plate xxviii, fig. 2) and a dark form with a median longitudinal white flash on forewing (plate xxviii, fig. 3). In addition there is an ochreous form with markings largely suppressed except for a diffuse brown transverse bar from costa at  $\frac{1}{3}$ ths to inner margin at  $\frac{2}{3}$ rds, and a few dark brown spots (plate xxviii, fig. 4). Intermediates occur between these forms.

The genitalia show a markedly serrated tegumen, a little produced towards the anterior end (fig. 6). As usual in species with a serrated tegumen there are slight variations in the development of individual spines; the degree of

asymmetry evident in the figured example is of the usual order. The genitalia suggest a relationship between this species, *O. serratus*, from Wondiwoi, and *O. subochracea*, but the resemblances do not extend to the wing-form, patterns, or size, which are very different.

If the same brief emergence limits hold for Papuan species as for Australian ones, this should be mainly a December species. The Messrs. Pratt took a long series, all males, of which ten examples have been examined in detail at Adelaide—the others during a visit to the British Museum.

OXYCANUS SUBOCHRACEA (Joicey and Talbot)

Plate xxvi, fig. 2-3 and text fig. 7

*Porina subochracea* Joicey and Talbot, 1917, *Ann. Mag. Nat. Hist.* (8), 20, p. 85, plate 2, fig. 12.

*Porina argentipuncta* Joicey and Talbot, 1917, *lc.* p. 85, plate 2, fig. 13.

*Paraoxycanus subochrea* Vietta, 1950, *Zool. Med.*, Leiden, 31, p. 71, fig. 6.

Male. Antennae short, tapering, pale ochreous, head and thorax brownish-ochreous, abdomen paler. Forewing brownish-ochreous with some gray along costa; a series of silvery-white spots, narrowly margined with dark brown, larger in discal area, where the largest is partly surrounded by an ochreous-brown suffusion darker along veins and towards inner margin at one-half; a wide

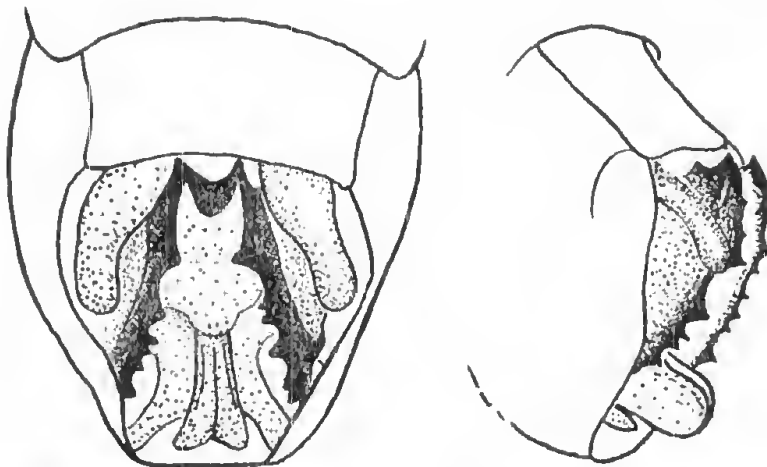


Fig. 7. *Oxycanus subochracea* (Joicey and Talbot), Wandammen Mts., November, male genitalia, ventral and oblique lateral views.

suffused grayish-white band from costa at  $\frac{3}{4}$ ths to inner margin at one-half, within it a line of small spots; between band and termen a series of spots, some large; a subterminal series of small spots surrounded by whitish-gray, one between each pair of veins. Hindwings subhyaline, pinkish-ochreous without markings. Forewing length 27 mm., expanse 60 mm.

*Loc.* New Guinea: Wandammen Mountains, 3,000-4,000 feet, November; type, a male, also type of *argentipuncta*, same details, and a series of paratypes from the type locality in British Museum; two males (ex Tring) in South Australian Museum.

The two named forms associated here are undoubtedly conspecific. The above description is based on an example which is almost identical with the type of *O. argentipuncta*. The genitalia have the outline of the tegumen, as viewed obliquely, rather evenly arcuate with only 6 to 7 small seriate spines which, in ventral view, appear to be irregularly placed (fig. 7). The differences in wing markings, between the two named forms, though considerable, follow the usual trend of variation; the typical one has a longitudinal white flash on forewing; the *argentipuncta* form has the flash absent, the spots are enlarged and these have conspicuous silvery-white centres. Plate xxvi, fig. 3, shows a third form in which the forewings are paler, the spots are black, and each is surrounded by an area of ochreous suffusion. In still other examples most of the markings are suppressed in favour of a uniform ochreous suffusion with scatterings of individually darker scales.

OXYCANUS HECABE sp. nov.

Plate xxviii, fig. 5 and text fig. 8

*Male.* Antennae ochreous, relatively long, pectinations 1. Head and thorax pale brown, abdomen palest salmon, becoming grayish-fawn towards apex. Forewings brown with bright ochreous suffusions towards base and paler ochreous along termen from near apex to beyond middle; several silvery-white marks bordered with brownish-black; traces of a slightly paler brown band from costa at two-thirds to inner margin at two-thirds partly margined by a series of ochreous patches, some embracing small spots; costa grayish-brown; a series of white-centred subterminal spots. Hindwings ochreous, becoming salmon-tinged towards base. Costa of forewings below narrowly brownish-black, rest of wings ochreous. Wing length 32 mm., expanse 70 mm.

*Loc.* New Guinea: Hunsteinspitze, 1,350 metres. Kaiserin Augusta Fl. Expedition, February to March, 1913, S. G. Bürgers (Sepik River). Type, a male, No. 4,509 in Berlin Museum; a paratype, same details, in South Australian Museum.

OXYCANUS HECABE form *lethe* nov.

Plate xxviii, fig. 6 and text fig. 9

*Male.* Antennae ochreous, appearing slightly shorter than in typical *hecabe*. Head and thorax ochreous gray, abdomen pale salmon, apical half becoming

grayish-fawn. Forewings grayish-ochreous with two moderate black spots and four subhyaline gray bands across wing; each band encloses a series of small black spots; the band commencing at 5/6th costa, runs only to near termen at about  $M_2$  vein; it is ochreous-tinged near costa; the fourth band is obscure, subterminal, and encloses a series of subterminal black spots each ringed with gray; cilia dark gray. Hindwings ochreous with a fuscous suffusion near posterior angle. Wings below ochreous, without markings; costal margin scarcely darker than rest of wing. Forewing length 29 mm., expanse 64 mm.

*Loc.* New Guinea: Hunsteinspitze, 1,350 metres, August, 1912, S. G. Bürgers. Type, a male, in Berlin Museum, a paratype male, same details, but labelled February-March, 1913, in South Australian Museum.

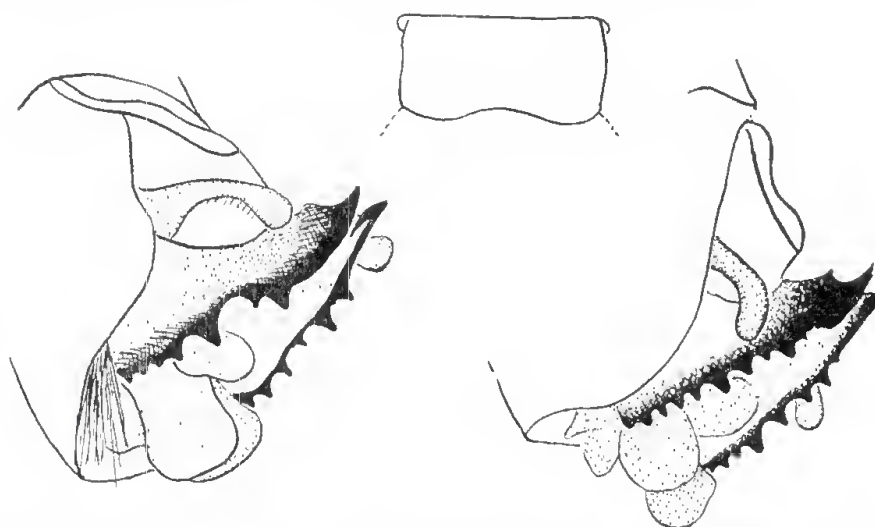


Fig. 8-9. Fig. 8 (left). *Oxycanus hecabe* Tindale, Hunsteinspitze, February to March, male genitalia, oblique lateral view. Fig. 9 (right). *O. hecabe* form *lethe* Tindale, Hunsteinspitze, August, eighth sternite and male genitalia, oblique lateral view.

The four specimens of *O. hecabe* available for study were taken at two different periods of the year, nearly six months apart. They belong to two very different colour forms which differ also in size and might almost be considered to be separate species. However, these colour changes cut across some slight structural differences in the genitalia, as may be seen from the following table:

	<i>hecabe</i> type	<i>hecabe</i> paratype	f. <i>lethe</i> type	f. <i>lethe</i> paratype
Colour	brown	brown	ochreous gray	ochreous gray
Wing length	32 mm.	28 mm.	29 mm.	29 mm.
Tegumen	irregularly serrated	irregularly serrated	regularly serrated	irregularly serrated
Emergence period	Feb.-March	Feb.-March	August	Feb.-March

Bearing in mind the inherent variabilities of colour pattern, repeated in so many species of *Oxycanus*, it might seem that there are two races or forms

of *O. hecabe*, genetically isolated since they emerge at different times of the year. These, perhaps, are descended from a common stock which already possessed two colour phases. Though now structurally differentiated and possessing different-seeming genitalia, the *lethe* colour phase still tends to appear in each strain. When further material is collected it will be of interest to learn whether a *hecabe*-like form appears also in the August appearing strain.

According to another possible explanation, *O. hecabe* and *O. lethe* could be two separate species of which one, *O. hecabe*, is variable and presents two separate forms, one of which is less readily differentiated from *O. lethe* on a basis of wing patterns. Both the above are attempted explanations of the presence of these two forms; they furnish another of the many significant problems associated with the study of these interesting species.

*O. hecabe* is probably closest to *O. subochracea* and in the key these species fall near to each other. One of the forms of *O. subochracea*, figured at plate xxvi, fig. 3, shows many points of resemblance to the form *lethe* of this species. However, the two species are separable on several characters of which one of the more evident is wing shape: the forewings of *O. subochracea* are relatively broader and the apex of hindwings somewhat less acute. The harpes also are of quite different shape.

The genitalia of *O. hecabe* (fig. 8) have the posterior margin of the eighth sternite transverse and slightly notched; the tegumen is armed with seriate spines which are somewhat irregularly disposed and irregular in size. In the form *lethe* (fig. 9) the seriate spines of tegumen are rather more even in size and arrangement.

#### OXYCANUS SERRATUS sp. nov.

Plate xxvi, fig. 6 and text fig. 10

Male. Antennae short, slender, tapering, pale ochreous; head pale brown, thorax paler, abdomen pale fawn with a pinkish tinge on basal half. Forewings pale brown, costa slightly more grayish-brown; two series of silvery-white spots each margined with brown; one a discal series of scattered spots, several of them partly embracing an irregular discal black patch; the other a transverse series running in stepped fashion in a line from near apex to near posterior angle; on the inner side of this line is a pale gray transverse band in which there are small brown spots; a subterminal series of small spots also are surrounded by pale grayish-white. Hindwings opaque yellowish-ochreous with the cilia rather evenly dark gray; wings below yellowish-ochreous. Forewing length 28 mm., expanse 60 mm.

*Loc.* New Guinea: Wondiwoi, Wandammen Mountains, 1,400 metres, July, 1928, Dr. E. Mayr. Type, a male, in British Museum (ex Tring). There is a paratype example.

This form is so similar in markings to some examples of *O. subochracea*, taken in the same mountains, that it is difficult to separate it until the genitalia are examined. There is between a three and a five months difference in emergence date. The Wondiwoi examples of *O. serratus* were taken in July at an elevation of just over 4,500 feet, whereas *O. subochracea* flies in November at 3,000-4,000 feet.

The type of *O. serratus* (plate xxvi, fig. 6) compares well with the *O. argentipuncta* form of *O. subochracea*, and it was thought at first that the name *argentipuncta* might be used for it. However, the type of *argentipuncta* was taken in November and unquestionably is an *O. subochracea* form.

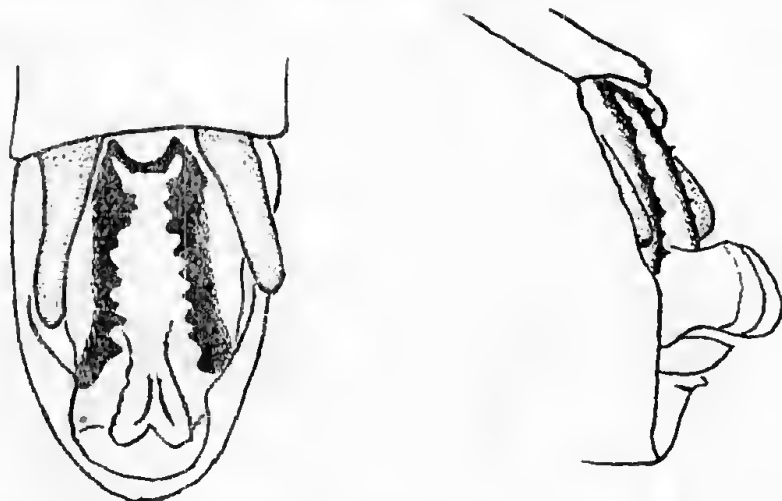


Fig. 10. *Oxycaenus serratus* Tindale, Wondiwoi, July, male genitalia, ventral and oblique lateral views.

The second example of *O. serratus* is an ochreous variant in which the brown of the thorax and wings and the pale transverse band of forewing are replaced by a bright ochreous colour; the silvery-white spots remain but tend to be slightly smaller, with the dusky margins sometimes encroaching on the white centres. This example was formerly identified as an example of *O. argentipuncta*, which it rather closely resembles, but like the type example, its genitalia are of *O. serratus* pattern. The essential difference lies in the contrast between the rather regularly serrated margin of the tegumen (fig. 10); as viewed from below, and the very irregularly serrated margin found in *O. subochracea*. The former has 9-10, the latter 6-7 spines. Another not so evident difference exists in the shape of the forewings, which are relatively narrow in *O. serratus* and

shorter and broader in *O. subochracea*. Despite the similarities it seems proper to regard them as separate species. If the two belong together then the genitalia must be very variable and the emergence period in this species must be an extended one, unlike other members of this puzzling genus.

*OXYCANUS THASUS* sp. nov.

Plate xxvi, fig. 5 and text fig. 11

Male. Antennae ochreous, short; head and thorax grayish-fuscous, abdomen pale ochreous-fuscous, dusker towards apex. Forewings with costa grayish-fuscous, elsewhere paler, with tinges of ochreous-fuscous; basal half of wing suffused whitish-ochreous with traces of a narrow median longitudinal light streak; several rows of small feebly white-centred fuscous dots across wing including a rather regularly spaced subterminal series. Hindwings pale ochreous-fuscous with terminal fourth from below apex to inner margin noticeably fuscous. Wings below pale ochreous. Forewing length 22 mm., expanse 50 mm.

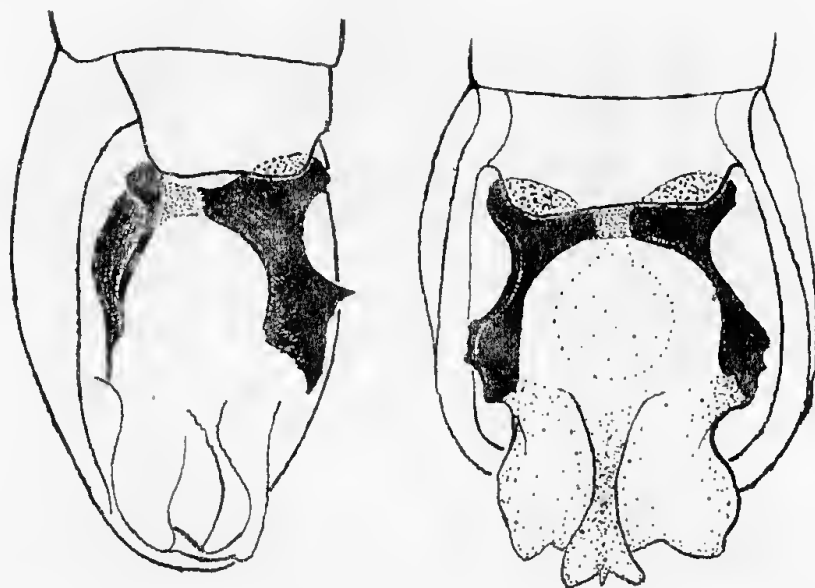


Fig. 11. *Oxycanus thasus* Tindale, Fak Fak, male genitalia, oblique lateral and ventral views, of type.

*Loc.* New Guinea: Fak Fak, 1,700 feet, December, 1906 (Pratt). Type, a male, 1911-117 in British Museum, unique.

The sub-rectangular hindwings are shared with several other Papuan forms such as *O. meeki*, from Biagi, and *O. perplexus*, from Ninay Valley. This species seems close in wing pattern to the non-fasciate form of *O. mayri* but in their genitalia these species bear little resemblance to each other.



The male genitalia (fig. 11) have the eighth sternite with a slightly excavate posterior margin; the harpes are concealed and anteriorly the tegumen is strongly chitinised; there is a large strap-like anterior projection behind which the tegumen is rather evenly excavate to the middle where it is again produced, showing from one angle a spine-like process, and from below a rather broad slightly dentate eminence.

In the only specimen parts of the genitalia are concealed by the eighth sternite, but the two camera-lucida sketches as shown, modified by free-hand sketching to suggest the approximate form of the hidden parts, should assist identification.

OXYCANUS SALMONACEA (Rothschild and Jordan)

Plate xxvi, fig. 7, plate xxix, fig. 7 and text fig. 12

*Porina salmonacea* Rothschild and Jordan, 1905, *Novit. Zool.*, 12, p. 478.

Male. Antennae pale buff, very short, stout and tapering rather abruptly to tip. Head and palpi mummy-brown, thorax slightly paler, abdomen loose-haired, buff with a salmon tinge. Forewings ochraceous-buff with costa slightly darker. Four black-edged spots in discoidal region, usually conjoined in pairs; there are traces of other spots with light centres; terminal third of wing paler, with a subterminal darker band embracing vague traces of spots from costa near apex to inner margin. Hindwing pinkish-buff becoming slightly more rose-coloured near base. Length of forewing 25 mm., expanse 56 mm.

*Loc.* Papua: Angabunga River, affluent of St. Joseph River, 6,000 feet upwards, November, 1904, to February, 1905, A. S. Meek. Type, a male, in British Museum (ex Tring), and a series of paratypes; one example with same details in South Australian Museum (from Tring).

The large tuft of hairs at base of the antenna is notable. This species has a generally rough-haired look shared with *O. fuliginosa*, which also is a form from relatively high altitudes. However, the two species are entirely different in colour and markings. Plate xxix, fig. 7, shows the type in the British Museum (ex Tring) and plate xxvi, fig. 7, shows the South Australian Museum specimen.

The genitalia (fig. 12) which have an anterior eminence on the tegumen, followed by a notch and several spines, may suggest a relationship with *O. thoe* of the Wandanmen coast. However, the species emerge at different times of the year, one not far from sea level and the other at 6,000 ft. elevation, and though superficially similar in markings, they differ in size, wing-shape, and details of the genitalia. In *O. salmonacea* the anterior spine of the tegumen, as viewed from below, is outwardly curled as a short flat strap-like spine with up to three

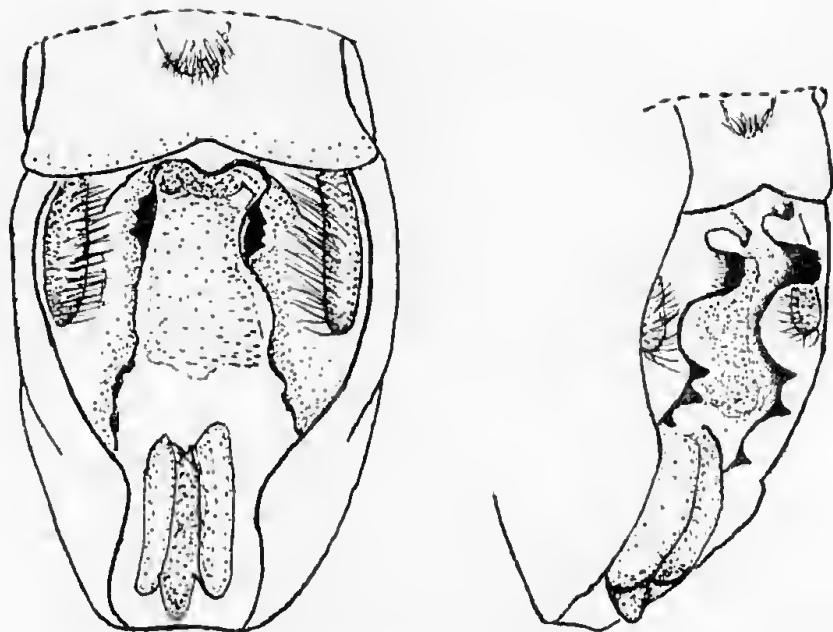


Fig. 12. *Oxycanus salmonacea* (Rothschild and Jordan), Angabunga River, male genitalia, ventral and oblique lateral views.

slight projections on it, whereas in *O. thoe* the spine tends to be a high, rather more rounded eminence, projecting outwards, usually as a single rounded point. The eighth sternite is different in the two species, having a notched posterior margin in *O. salmonacea* and an only slightly arched one in *O. thoe*.

There is a specimen in the British Museum labelled Mafalu (?=Mafulu), 6,000 feet, August, 1903 (A. E. Pratt), which seems close to this species. It was not possible to examine the genitalia. It will be noted that the season of emergence is entirely different (August instead of November-February), hence the possibility that it will prove, on further study, to be a separate species.

#### OXYCANUS NIGRIPUNCTA (Joicey and Talbot)

Text fig. 13

*Porina nigripuncta* Joicey and Talbot, 1917, *Ann. Mag. Nat. Hist.* (8), 20, p. 83, plate 2, fig. 10.

*Porina nigricosta* Joicey and Talbot, 1917, *lc.* p. 84, plate 2, fig. 11.

Male. Antennae pale ochreous; palpi, head and thorax above brownish-ochreous, thorax below and abdomen pale ochreous. Forewings ochreous gray numerous transverse brownish-black spots (sometimes with pale centres) between the veins, ones at middle and end of cell and near junction of  $M_4$  and  $Cu_{1a}$  larger than the others; traces of a line of brown suffusion from costa at

three-fifths to inner margin at one-half; a similar faint suffusion from four-fifths costa to near inner angle. Hindwings ochreous; an indistinct series of sub-terminal spots between the veins. Wing length 36 mm., expanse 78 mm.

*Loc.* New Guinea: Wandammen Mountains, 3,000-4,000 feet, in November. Type, a male, also type of *O. nigricosta*, same details, in British Museum.

There seems to be little doubt that *O. nigripuncta* and *O. nigricosta* are merely colour forms of the one species.

*O. nigricosta* has the forewings with costa darker, the dark spots larger, and the spots, linked to form faint transverse streaks at three-fifths and four-fifths, are broadened into dark bands extending nearly to hind margin. Both forms are figured in colour by Joicey and Talbot. The structure of the genitalia, so

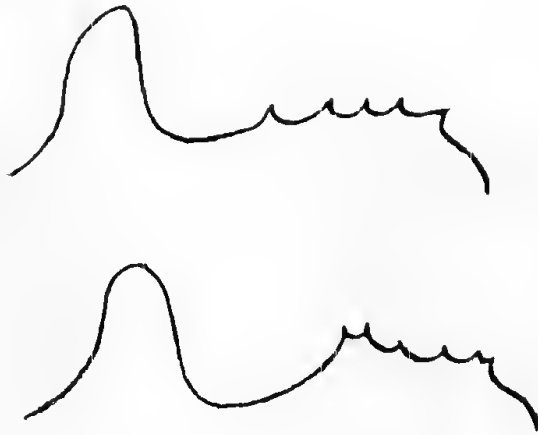


Fig. 13. *Ozycaenus nigripuncta* (Joicey and Talbot), upper, silhouette of tegumen of *nigricosta*, type; lower, the same of *nigripuncta*, type (anterior extremity at left).

far as they can be seen in the types are the same, and the ranges of variation in other characters are only such as are commonly found within specific limits in other species of the genus.

The main outlines of the tegumen were sketched, free-hand, during an examination of the types in the British Museum (fig. 13). The upper figure is that of the type of *O. nigricosta*, the lower that of *O. nigripuncta*. The species falls into a suite in which *O. salmonacea* from Angabunga River at 6,000 feet, *O. thoe*, from Wassior at sea level, in July, and *O. meeki*, from Biagi at 5,000 feet, taken about March, are kindred forms. In *O. meeki* the main process of the tegumen is placed in a medial position much behind that found in the present form.

## OXYCANUS THOE sp. nov.

Plate xxvi, fig. 4, plate xxx, fig. 3 and text fig. 14.

Male. Antennae ochreous, short, pectinations very short, palpi brownish-ochreous, head and thorax ochreous, abdomen pale ochreous. Forewings sub-falcate, brownish-ochreous with a broad somewhat more grayish-brown band across forewing from costa at threequarters to near inner margin; a number of white-centred brown spots between the veins; two large silvery-white centred spots in disc and some smaller ones; traces of a dark brown streak from near base of wing to termen before one-half. Hindwings pale ochreous, tinged with pink in basal half, cilia nearly concolorous with rest of wing. Length of forewing 33 mm., expanse 72 mm.

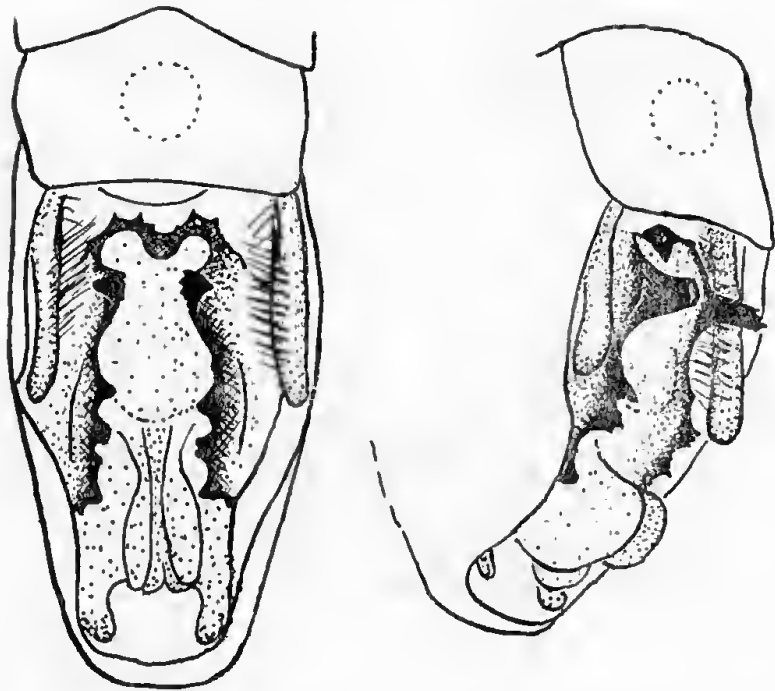


Fig. 14. *Oxycanus thoe* Tindale, Wassior, July, male genitalia, ventral and oblique lateral views.

*Loc.* New Guinea: Wassior, Wandammen coast, July, 1928, Dr. E. Mayr. Type, a male, in British Museum; there is a paratype with same details.

This is a relatively large species with rather broad forewings (plate xxvi, fig. 4), having a tendency to truncated hindwings, as seen also in the much smaller *O. salmonacea* from the Angabunga River. The genitalia of these two species fall into the same group, the arming of the tegumen being similar, except for details. The posterior margin of the 8th sternite is almost transverse

in this species, whereas it has a wide median notch in *O. salmonacea*. The tegumen (fig. 14) has an outwardly bent, blunted spine on the anterior third, slightly variable, as may be seen from the two drawings, one from the type and the other from the paratype. In this species the harpes are more slender than in *O. salmonacea*.

The second example (plate xxx, fig. 3) has the wing tips injured. It differs from the type in having a black streak from base of forewing to termen just above 1/2. This form has a close superficial resemblance to *O. salmonacea*.

OXYCANUS ALBOSTRIGATA (Rothschild)

Plate xxix, fig. 3, plate xxx, fig. 7-8 and text fig. 15

*Phassodes albostrigata* Rothschild, 1913, *Novit. Zool.*, 20, p. 278.

Male. Antennae ochreous, short, slender, pectinations 1. Head and thorax grayish-fuscous, abdomen gray. Forewing with costa narrowly gray, rest of wing ochreous fuscous, paler towards apex of wings with darker fuscous suffusions; two series of irregularly connected silvery-white spots margined with fuscous in discoidal area; a single ochreous-centred spot near inner margin at one-half and other smaller ones forming a series along costa and scattered across wing. Hindwings with anterior half pale ochreous-fuscous, posterior half darker; a series of small vaguely pale-centred gray spots, one between each vein along termen. Forewing length 30 mm., expanse 65 mm.

Female. Antennae ochreous, very short, slender and simple; head and thorax pale grayish-fuscous, abdomen pale fawn. Forewings pale ochreous-fuscous, with paler ochreous markings in patches between the veins; two groups of silvery-white discoidal markings as in male; other markings present are margined with ochreous; hindwings pale ochreous-fawn, without subterminal spots. Forewing length 38 mm., expanse 81 mm.

*Loc.* New Guinea: Bolauberg, Huon Gulf, 3,600 metres (Keysser). Type, a female, in British Museum (ex Tring); Rawlinson Mountains (Keysser), allotype, male, described herein; an additional series of five females has been examined.

Hitherto known only from the type, a female in the British Museum (ex Tring). This was taken on Bolauberg, inland from the Huon Gulf, at 3,600 metres. This example, expanding 72 mm., is somewhat similar in markings and colour to some males of *O. mayri* from Mt. Siwi, but is unlikely to be conspecific. Plate xxix, fig. 3, depicts the type. Structurally this species is notable for the relatively long 3rd segment of the palpi which are carried directed downwards and forwards.

The male is now described from takings in the same area; the second female example, also figured, was taken along with this male on the Rawlinson Mountains of which Bolauberg is a part. The wing markings of the two sexes are similar although the small terminal gray spots on the hindwing are absent from the female; the suffusions on forewings of the female are ochreous rather than grayish-brown, and there is less infuscation in the discoidal area. Two of five females examined are larger and have the forewings rather gray in colour.

As indicating our relative paucity of material in this genus from New Guinea, this is the only New Guinea species of *Oxycanus* of which the female is yet known.

The male genitalia have the posterior margin of the eighth sternite slightly concave. The tegumen, in oblique lateral view, shows a slightly anteriorly directed, outwardly rolled projection, rather flat at summit, placed well before middle; also a slightly elevated median and posterior portion armed with two larger and several smaller spines. Fig. 15 shows as much of the genitalia of the allotype male as may be sketched without dissection; for convenience of presentation a view from the left side has been mirror-imaged to make it more directly comparable with drawings of other species, shown as viewed from the right.

The genitalia alone might suggest that this species falls near to *O. nigripuncta* and to *O. thoe* from Wassior; from both of these it is distinct in the form and markings of the wings. In the presence of small terminal spots on the hindwings there are suggestions of affinities with *O. eos* from the Cyclops Mountains, and *O. thasus* from Fak Fak; in the latter species these spots are only faintly represented.

#### OXYCANUS ATROX sp. nov.

Plate xxx, fig. 5-6 and text fig. 16

Male. Antennae ochreous, short, pectinations 1, delicate. Head and thorax ochreous-brown, abdomen pale fawn, more ochreous at tip and hairs pink-tinged at base. Forewings rich ochreous-brown, slightly darker towards termen with series of small brown markings, generally with ochreous centres and surrounded by ochreous suffusions. Hindwings ochreous-fawn, with hairs at base tinged pink; cilia fuscous. Wings below ochreous-fawn, cilia fuscous. Forewing length 33 mm., expanse 72 mm.

*Loc.* New Guinea: Buntibasa district, Kratke Mountains, 4,000-5,000 feet, August, 1932, F. Shaw Mayer. Type, a male, also two paratypes, taken July

and August, 1932, in British Museum (ex Tring); another paratype male, same details, was taken June, 1932.

The examples examined were taken during the three months June, July and August; the June example is superficially rather distinct; however, the genitalia are very close, differing only in minor details of the anterior spines of tegumen, which are slightly less conspicuous. An *Oxyeanus* similar in appearance, taken

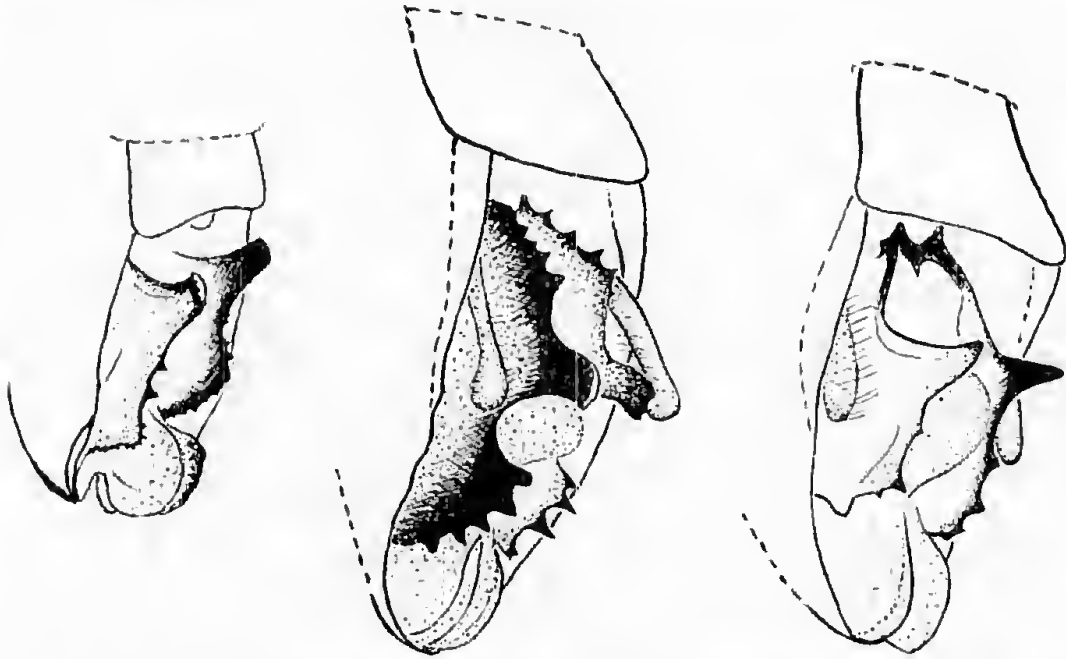


Fig. 15-17. Fig. 15 (left). *Oxyeanus albostrigata* (Rothschild), Rawlinson Range, allotype male, genitalia, oblique lateral view. Fig. 16 (middle). *Oxyeanus atrox* Tindale, Buntibas, August, male genitalia, oblique lateral view. Fig. 17 (right). *Oxyeanus eos* Tindale, Cyclops Mts., male genitalia, oblique lateral view.

in February, 1933, at the same place, may be a distinct species, but it has not yet been studied. It is in the British Museum (ex Tring). Evidently, as in other members of this genus, the species is variable in colour and markings; the type example represents an ochreous form with dark markings reduced and tending to be ochreous-centred, whereas one paratype (plate xxx, fig. 6) tends a little towards a florid form with more conspicuous dark markings and with white suffusions instead of ochreous ones. In the examples seen the strongly rounded hindwings are the same as is also the dark ciliation, which gives a rather clear-cut margin to the hindwing outlines; the dense clothing of down at the base of the hindwings is locally and strongly pink-tinged. In life the pink colour was probably most brilliant, but as in Australian species such as *O. stellans*, is fugitive, fading rapidly after death.

In the male genitalia (fig. 16), the tegumen is divided into an armed anterior portion with five or more spines, a median eminence, which has its body bent inwards towards the centre line but at the tip is bent outwards again, and a heavily armed posterior portion with five spines. The harpes are more slender and more conspicuously dilated at the apex than in the other species examined from New Guinea. The genitalia in general are quite unlike those of any other species, showing perhaps some distant relationship with those of *O. hebe* from Fak Fak. In the present species the enlargement of the central portion of the tegumen and its incurvature has not reached the extreme met with in *O. hebe*; instead the anterior and posterior armatures are emphasised.

OXYCANUS EOS sp. nov.

Plate xxix, fig. 4 and text fig. 17

Male. Antennae ochreous brown, very short, pectinations transversely carinate; head and thorax ochreous brown, abdomen somewhat paler. Forewings bright ochreous with costa and various suffusions brownish-ochreous—towards base colour is very rich; several series of transverse lines of small, generally pale-centred blackish-brown spots, a particular series, running from costa at three-fourths to hind margin at two-thirds, are obscurely margined in light grayish-fawn scales, the ochreous suffusions near base are richly coloured and there is a particularly evident patch of darker suffusion surrounding a relatively large black spot near posterior margin at one-half; cilia brown. Hindwings grayish-fawn, darker near anal margin, along termen ochreous with a series of faint brown spots between the veins. Forewing length 30 mm, expanse 64 mm.

*Loc.* New Guinea: Cyclops Mountains, August to September, 1928, Dr. E. Mayr. Type, a male, in British Museum (ex Tring); there is a paratype male with the same details.

This species is conspicuous for its pointed and relatively narrow forewings. Both examples examined are similar in markings, the paratype example differing chiefly in the absence of the pale band across forewing; the hindwing is less evidently infuscated.

In the genitalia (fig. 17) the outline of the tegumen is excavated at the anterior end and bears a large simple spine just before the middle; the posterior half shows several smaller spines; these are spaced rather widely apart.

This species is not close to any other; in the form of the armature of tegumen it falls nearest to *O. occidentalis* of South Western Australia, but in form of wings and coloration does not show close relationship with that species; its closest links possibly are with *O. albostrigata* from the Rawlinson Ranges, inland



from the Huon Gulf, and it shares with the male of that species, and with *O. thasus* from Fak Fak, the presence on the hindwing above of an inconspicuous series of terminal gray spots between the veins; in both these species, however, the genital armatures are different.

#### OXYCANUS PERPLEXUS

Plate xxxi, fig. 3-4 and text fig. 18

Male. Antennae ochreous, short, pectinations about 1. Head and thorax grayish-brown, tending more to gray on metanotum; abdomen pale creamy-fawn slightly darker at apex. Forewings pale grayish-brown, darkest along costa, with about eight rows of transverse creamy-white spots, outlined with brown; a median silvery-white flash runs from base to termen above one-half, where it turns towards apex; this fascia is wide near base then suddenly narrowed at one-half; a darker suffusion lies between it and margin; there is a subterminal series of spots, one between each vein. A faintly visible broad gray band runs from costa at four-fifths to just beyond inner angle. Hindwings creamy-fawn with subanal fourth of wing, extending to near apex, infuscated with grayish-brown; cilia grayish-brown. Wing length 27 mm., expanse 58 mm.

*Loc.* New Guinea: Ninay Valley, Central Arfak Mountains, 3,500 feet, November, 1908, to January, 1909. Type in British Museum; there are three paratypes with the same details.

The paratypes (for example, plate xxxi, fig. 3) appear rather different from the type because the broad gray transverse band from four-fifths costa to inner angle of forewing is emphasised and the silvery-white longitudinal flash tends to be suppressed. The cream-centred spots are the same as in the type (plate xxxi, fig. 4); the colour of the hindwings is identical.

The genitalia (fig. 18) have the posterior margin of the eighth sternite slightly convex. The tegumen has a smooth-margined anterior portion, rising at about a right angle into a large, median, outwardly twisted eminence, showing a slightly serrated outline and outwardly curved tip; behind this the margin drops to a shallow notch, followed by two or three rather evident, and several less conspicuous spines. The harpes are long, their tips extending to the first of the posterior suite of spines of tegumen. In postero-ventral view the central elevations of the tegumen appear as a pair of shining castaneous subquadrate plates, bent obliquely forwards.

This species and the two following are closely related, standing somewhat apart from other New Guinea species. They may be distantly related to the Australian *O. nuptialis* from Mt. Kosciusko. However, in that species the hind-

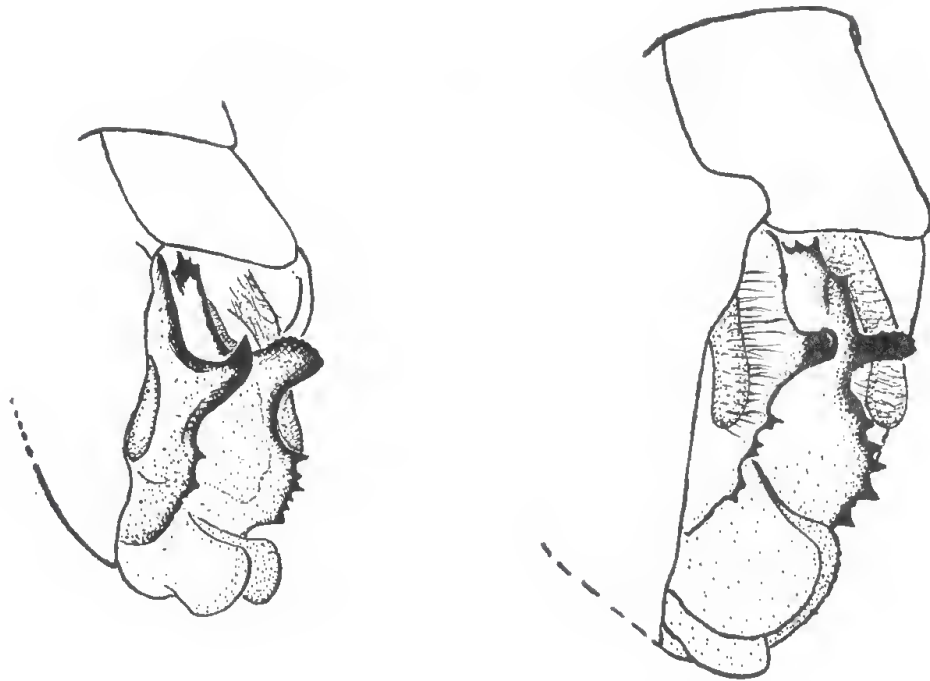


Fig. 18-19. Fig. 18 (left). *Oxycanus perplexus* Tindale, Ninay Valley, male genitalia, oblique lateral view. Fig. 19 (right). *Oxycanus meeki* (Viette), Biagi.

wings are more acute, the wings are subhyaline, and the genitalia show little relationship. There are resemblances to *O. subvarius*, also from Australia, particularly in the pattern of spots on the wings and the wing texture, but again the genitalia are very different. The mutual relationships of this and the two following species are discussed under the heading of the species *O. discipennis*.

#### OXYCANUS MEEKI (Viette)

Plate xxx, fig. 1-2 and text fig. 19

*Paraoxycanus meeki* Viette, 1950, Zool. Med., Leiden, 31, p. 69, fig. 5.

Male. Antennae ochreous, short, pectinations 1. Head, thorax and tip of abdomen brownish-ochreous, base of abdomen light pinkish-fawn becoming tinged with gray towards extremity; clothing of body and of hindwings relatively thick, scaling of forewings rather rough and hairy. Forewings pointed at apex, almost falcate in form, brownish-ochreous, darker along costa with some black- and some silvery-white-centred black spots, a creamy-white longitudinal flash from base to near termen above middle where it expands into a subterminal suffusion which runs from just below apex to end obscurely near anal angle; two conjoined lines of predominantly black spots cross the wing, the first from

near costa at five-sixths running nearly parallel to termen to touch anal angle; in the centre of the wing there is an obscure infuscation below the longitudinal white flash, basally from this the flash is much broadened; cilia brownish-ochreous. Hindwings angulate, costa and termen meeting nearly at right angles, pale pinkish-fawn, darker along costa and near anal angle; traces of spots, some obscurely white-centred, one between each vein of termen; cilia fawn. In life the down at base of wings was probably strongly pink-tinged, traces remain. Wing length 29 mm., expanse 62 mm.

*Loc.* New Guinea: Biagi, Mambare River, 5,000 feet, March, 1906, type in Paris Museum; a series of fourteen labelled January to April, 1906, A. S. Meek, from same locality are in the British Museum (ex Tring), and one, labelled March, 1906, in South Australian Museum.

As in other species of this genus, the wing markings show variations. The figured specimen (plate xxx, fig. 2) and one of the other examples seen are rather similar, although in the last named the silvery-white spots are a little larger. They share a longitudinal white flash extending from base of forewing nearly to termen where it expands into a broad fan-shaped suffusion from just below apex nearly to anal angle. In yet another example (plate xxx, fig. 1) the white flash is replaced by a similar, but brownish-black one. This type of variation, by colour replacement, is common in *Oxyeanus* species.

The genitalia (fig. 19) have the 8th sternite with posterior margin straight. The tegumen has a slender, almost parallel-sided median spine with gently serrated outline, the tip of it is outwardly bent over. There is a single small spine in the middle of the anterior half of teguminal margin, and a set of five to six medium-sized spines on posterior half. On one margin of the example drawn these spines tended to be grouped together in pairs, this is not quite so evident on the other margin.

The armature of the tegumen tends to place this species near *O. perplexus* and its allies, but the central spine is very different in its proportions. In wing form and markings these two species obviously lie rather far apart. A link is that the longitudinal white fascia of the forewings, when present, shows a common tendency to be expanded in basal half and be narrowed in apical part of the wing, suggesting some ancient tie. The markings of the wings might also suggest a relationship with *O. rileyi*, but the subfalcate forewing of the present species is quite distinctive.

The above description and figures were prepared before the paper by Viette became available; the species seems unquestionably to be that described by Viette, but there has been no time for a direct comparison of specimens.

## OXYCANUS MAYRI sp. nov.

Plate xxxi, fig. 1-2 and text fig. 20

Male. Antennae pale ochreous, pectinations short, less than 1. Head and thorax dark ochreous-fawn, abdomen pale ochreous-fawn. Forewings pale ochreous-fawn, slightly darker along costa with ochreous suffusions and a broad ill-defined ochreous band from costa at four-fifths to inner margin; there are seven or more transverse rows of brown spots, some larger and with ochreous centres, also a subterminal series of spots each surrounded by an ochreous patch. Hindwings pale ochreous-fawn, slightly darker towards anal angle; traces of a series of subterminal spots; cilia dark fawn. Wing length 26 mm., expanse 56 mm.

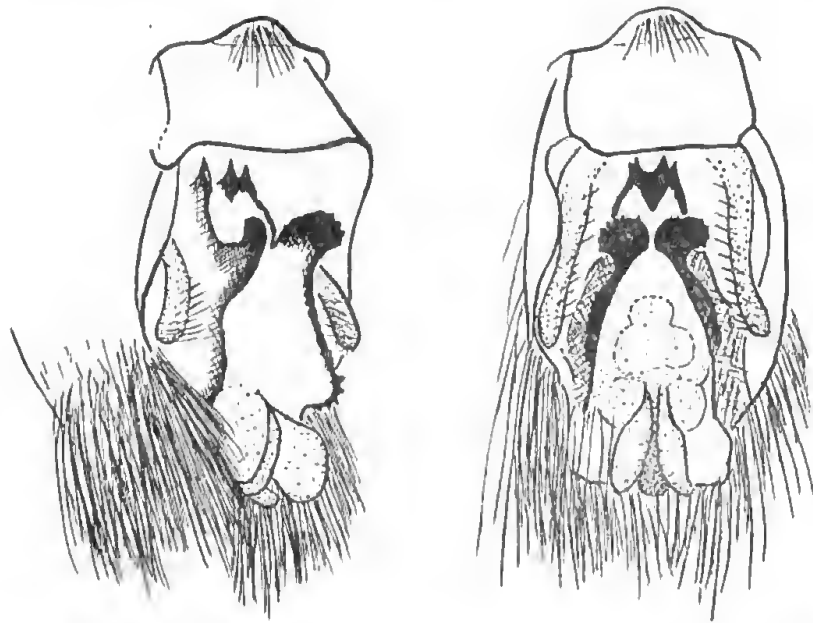


Fig. 20. *Oxycanus mayri* Tindale, Mt. Siwi, male genitalia, oblique lateral and ventral views.

*Loc.* New Guinea: Mt. Siwi, Arfak Mountains, 800 metres, 13 May, 1928, Dr. E. Mayr. Holotype, a male, in British Museum (ex Tring); there are eight paratype males with the same details. A worn male example, not critically studied, is dated as having been taken 23rd April, 1928, at the same locality.

A paratype specimen (plate xxxi, fig. 2) differs somewhat from the example described above, being superficially similar to the type of *O. perplexus*. As in that species, it possesses a white flash from base to termen of forewing. The hindwing, however, agrees well with the type as also do characters of the genitalia; it seems evident that wing markings follow the same tendency to variation as is met with in many other species of *Oxycanus*.

The male genitalia (fig. 20) have the tegumen much as in *O. perplexus*, but the anterior notched portion is shorter, the central elevation is more conspicuous and in postero-ventral view appears as a dark, serrated, nearly circular plate; there are no large, and only a few small spines on the posterior half of the margin.

*OXYCANUS DISCIPENNIS* sp. nov.

Plate xxx, fig. 4 and text fig. 21

Male. Antennae ochreous, short, hairy, pectinations short (half or less), palpi projecting beyond frons; head and pronotum pale ochreous-brown, rest of thorax paler; abdomen creamy-fawn slightly more ochreous at base. Forewings pale grayish-brown, rather more gray along costa, with traces of brown spots surrounded by ochreous patches arranged in transverse series across wings; cilia dark fawn. Hindwings pale ochreous fawn with a dusky suffusion extending inward from anal angle between  $Cu_{1b}$  and  $Cu_2$  veins; in life the base of wing was probably tinged pink, traces of this remain; cilia dark fawn. Wing length 26 mm., expanse 56 mm.

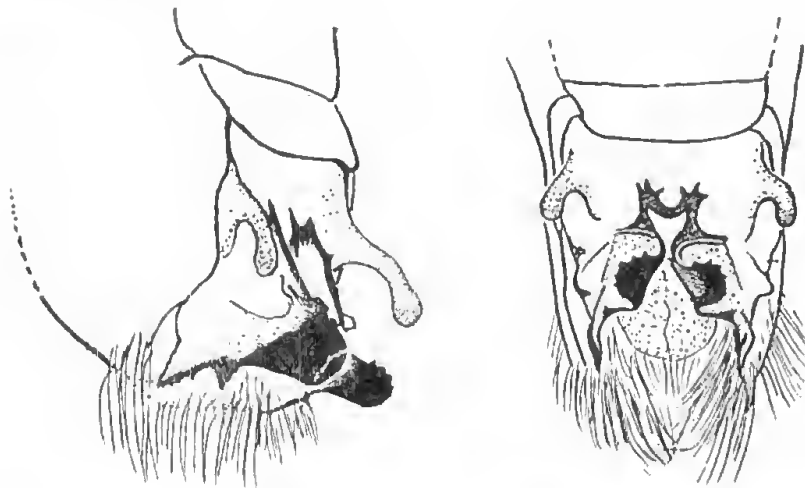


Fig. 21. *Oxycanus discipennis* Tindale, Mt. Siwi, May, male genitalia, oblique lateral and ventral views.

*Loc.* New Guinea: Mt. Siwi, Arfak Mountains, 800 metres, 13 May, 1928, E. Mayr; type, a male, in British Museum (ex Tring); there is one other available example, a worn male, with same details.

This species was taken at the same time and place as *O. mayri*, of which it, at first glance, might be taken to be merely a variant form in which the forewing markings were partly suppressed. The resemblances in the hindwing

accentuate the similarity. However, the greater degree of rounding of the hindwings appears real, there are no subterminal spots, and the genitalia show marked differences, being especially distinct because of the exaggerated folding of the central eminence of the tegumen. This folding is accentuated by a lateral ridging of the margin between it and the anterior extremity (fig. 21).

In both examples of this species the anterior portion of the teguminal margin is less acutely notched than in *O. perplexus* and *O. mayri*; in the presence of a medium-sized spine and traces of other smaller ones on the posterior part of the tegumen it is closer to the former species. The harpes rise from a broad base to a narrowed median portion which is dilated in a knob-like extremity.

The complex of forms here described as *O. perplexus*, *O. mayri* and *O. discipennis* have constituted a problem, the complexities of which may, or may not have been solved. All three have points of resemblance, in size, range of markings and general facies, and it is evident that they belong to a closely linked species group. *O. perplexus* and *O. mayri* were taken in the same general area, at slightly different altitudes, 3,500 versus 2,500 feet, at periods of the year at least 3½ months apart. Since *Oxycaenus* adults have a very brief non-feeding adult life, the emergence period is usually restricted, hence the different emergence periods may have significance. The genitalia are different, although sometimes they require more than superficial examination to establish the differences. Acceptance of *O. perplexus* and *O. mayri* as distinct species on these grounds does not immediately resolve the puzzle because the wing markings in the two species are variable and wing patterns appear to range counter to genital structure. A *mayri*-like form of *O. perplexus* exists as well as a *perplexus*-like form of *O. mayri*. However, the hindwing characters seem to run with genitalia and help to emphasise the distinctive character of the two species.

Although the view that these are all separate species is accepted, there may be alternative explanations. It is possible that the difference between *O. mayri* and *O. perplexus* are only of subspecific value, the isolating factor being *time of emergence* rather than *spatial separation*, since the areas of occurrence are not very far apart.

A third possible view would be that the genitalia themselves are not constant and that all the variant forms belong to one species which also has a wide range in time of emergence. In the case of Australian members of the genus *Oncopera* a similar situation was met, but was resolved on further work, when the forms were proved all to be quite separate species.

The present species, *O. discipennis*, does not assist the solving of the problem and is puzzling in another way. It was taken along with examples of *O. mayri*

at the same time and place. There are some similarities in markings, but the genital structures are very distinct, although they show relationships with those of both *O. mayri* and *O. perplexus*.

OXYCANUS HEBE sp. nov.

Plate xxvi, fig. 8 and text fig. 22

Male. Head and thorax ochreous brown, abdomen pale fawn. Forewings ochreous brown, slightly darker in centre of wing, with two discoidal silvery-white spots, each narrowly margined with black; traces of other dark spots below them, and series of smaller white-centred spots, rimmed with pale fawn, along termen; also a double subterminal series rather irregularly aligned. Hindwings pale fawn. Wings below pale fawn, the hindwings slightly more ochreous-tinged. Forewing length 30 mm., expanse 66 mm.

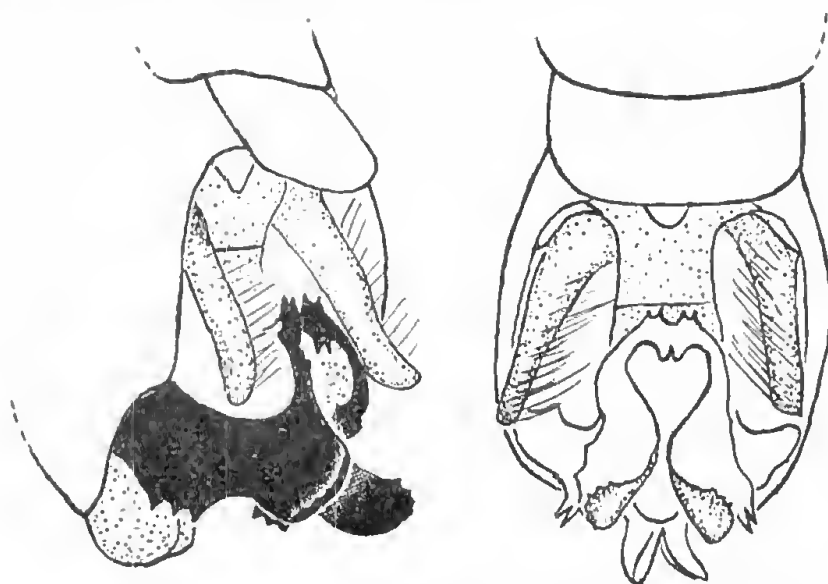


Fig. 22. *Ozycanus hebe* Tindale, Fak Fak, male genitalia, oblique lateral and ventral views.

*Loc.* New Guinea: Fak Fak, 1,700 feet, January and February, 1908 (Pratt). Type, a male, 1911-117 in British Museum.

Although this species occurs in the same district and altitude as *O. thusus* and is about the same size, it appears about a month later in the season and evidently is quite distinct. Its genitalia (fig. 22) are entirely different in form, possessing a large median expansion on the tegumen which curls inwards and then outwards so that the processes of opposite sides almost meet in the midline. The only available example, unfortunately, lacks its antennae. Without examination of the genitalia the example would probably have been placed with *O. nigri-*

*puncta* to which it has a close superficial resemblance. It differs in the relatively large size of its forewings and the shape of the short wide hindwings. The genitalia are closest to those of *O. discipennis* but differ in the much enlarged size of the median process on the tegumen and in possessing "normal" harpes rather than the knob-like ones of *O. discipennis*.

OXYCANUS (PARAOXYCANUS) NOVAGUINEENSIS (Viette)

*Paraoxycanus novaguineensis* Viette, 1950, Zool. Med., Leiden, 31, p. 68, fig. 3 and 8.

*Loc.* New Guinea: Paniai, 4 September, 1939, taken by the Nieuw Guinea Expedition, K.N.A.G., 1939. Type in Leiden Museum.

The tegumen in this species, which has not been seen, is figured as very similar to that of *Oxycanus tamsi*, described earlier in this paper. In the key given here the species would fall out close to *O. tamsi*, but the harpes appear much shorter in the present species. The two were taken at different times of the year and are different in size and coloration.

ADDITIONS TO AUSTRALIAN SPECIES OF OXYCANUS

(See Part III, these Records, v. 5, 1935, p. 280-331.)

Large series of most of the Australian species of *Oxycanus* have been brought together by collectors since the earlier Revision appeared and several additional new species have been discovered; in the main, however, the account of the genus given earlier still holds.

OXYCANUS BYRSA (Pfitzner)

Pfitzner could not have examined this form closely for, despite the different venation, he regarded it merely as a variety of "*Pielus hyalinatus*." Pfitzner and Grede, in Seitz Macrolepidoptera 10, 1933, p. 834, retained it in *Abantiades*. The late Dr. B. L. Middleton took many specimens at Ebor, New South Wales, in April and May, and it is now a comparatively well-known species; examples exactly matching the type have been taken. The venational patterns and general structure clearly indicate that it is an *Oxycanus*.

OXYCANUS GLAUERTI SP. NOV.

Plate xxxii, fig. 1-4 and text fig. 23

Male. Antennae moderate, ochreous, pectinations short, less than 1; palpi brown, smooth-haired, porrect, not long; head and thorax pale brown, abdomen at base ochreous, becoming pale brown at apex. Forewing opaque, dull brown



with scattered yellow scales concentrated along veins, along costa at three-fourths, and in an obscure band from base to outer margin at one-half; there is a silver spot near apex of cell and traces of another nearer to base, the area between them is uniformly brown; there is a marginal series of brown spots between the veins from apex to inner margin, with a parallel submarginal series and traces of still others in the middle of the wing; several of them have traces of silvery-white scales forming centres to the spots. Hindwings pale ochreous at base and along veins, becoming dull brown towards apex. Wing length 26 mm., expanse 56 mm.

Female. Larger, generally gray with a few traces of markings chiefly confined to a small irregular silvery-white spot near apex of cell and a few dark brown scale patches also in the cell; the base of the abdomen and the base of hindwings obscurely ochreous. Wing length 41 mm., expanse 88 mm.

*Loc.* Western Australia: no specific locality indicated; type, a male, and allotype, female, in British Museum (labelled W. Australia, G. C. Shortbridge, 1906-293); there are seven other examples.

I have pleasure in naming this interesting species after Mr. L. Glauert, who, as Director of the Western Australian Museum at Perth, has done so much for the general study of zoology in Western Australia.

As in so many others of this genus, the wing patterns and colours of the male of this species show considerable variation in detail. The type is well marked and dark; one paratype tends to a pale extreme with the posterior



Fig. 23. *Oxycaeus glauerti* Tindale, Western Australia, outline of tegumen in lateral view and of eighth sternite.

three-fifths of the wing yellowish and markings largely suppressed. A third male is much worn but shows a darker phase in which the yellow scales are not as evident.

Examination of the male genitalia will at once identify the species. The tegumen bears three principal spines (fig. 23), a medium-sized anterior one, followed by a slightly smaller one, then a large posterior one, swollen at base and tapering to a sharp spine. The 8th sternite has its hind margin evenly concave.

The simple posterior spine of the tegumen is in marked contrast with the many-spined process found here in *O. determinatus* (Walker), its nearest ally in Western Australia. From that species it differs conspicuously also in the much shorter, rather porrect palpi. Of Eastern Australian species it has, in the male, the most general superficial resemblance to *O. nuptialis* Tindale. Absence of an armed posterior lobe to the tegumen of this species indicates the two are not very closely related.

ONYCANUS KOCHI sp. nov.

Plate xxxii, fig. 5-6 and text fig. 24

Male. Antennae pale fawn, pectinations weak ( $1\frac{1}{2}$ -2); palpi slender, porrect smooth-haired; head and thorax fuscous, abdomen light yellowish-fawn becoming a little darker at apex. Forewings pale ochreous fawn; the costa dark fawn; markings comprise a series of obscure dark fawn spots, one series diminishing in size running from near apex to near inner angle with several obscure blotches of the same colour surrounding white scales on each side of vein  $R_5$ . Hindwing rather narrowly ochreous-fawn along costa and on veins, elsewhere fuscous. Wing length 27 mm., expanse 60 mm.

Female. Larger, with elongate forewings uniformly pale grayish-fawn in both wings, with traces of a semi-lunate white patch of scales at apex of cell of forewing. Wing length 40 mm., expanse 87 mm.



Fig. 24. *Oxycanus kochi* Tindale, Australia, outline of tegumen, and of eighth sternite.

*Loc.* Australia. Type, a male (No. 10797), and allotype, female (No. 10798), in Senckenberg Museum (labelled only as "Australien"); also one paratype, male, labelled "New Holland," in Oxford University Museum.

The abraded condition of the three specimens and their lack of exact provenance has hitherto deterred me from a description. However, the genitalia of the males are distinctive and will enable the species to be readily recognised when further material comes to hand. The similarities in the palpi in the two Senckenberg examples helps to convince me that they are correctly associated as male and female of one species. The lastnamed examples long stood in the

Senckenberg collection under a name label "*hyalinatus* Koeh." They are, of course, typical members of the genus *Oxycanus*.

The species appears to be distantly related to *O. nuptialis* and there are some general resemblances, such as the slightly pointed wings of the male and the somewhat elongated wings of the female, but the body build is more robust, the markings less evident, and the genitalia show distinctive features.

The male genitalia have the tegumen with a long anterior projection and also a large bifurcate posterior pair of blunt spines with a straight margin between them (fig. 24). In the key by Tindale (1935, p. 283, *et. seq.*) it would fall on p. 287 under a heading "*gg.* Tegumen with only posteriorly directed post-suspensorial spines or projections."

The very battered Oxford University Museum example seems undoubtedly to belong here, the genitalia, so far as they may be seen without dissection, being identical. The forewings bear more definite silvery-white markings which occupy a roughly V-shaped space near the extremity of the cell and below it. In this detail the species bears a superficial resemblance to the male of *O. niphadias* in which, however, the markings are nearer to the base of the wing. Other markings present include two ill-defined silvery-white spots in the cell.

*OXYCANUS ARMATUS* sp. nov.

Plate xxxii, fig. 7 and text fig. 25

Male. Antennae and palpi not preserved in available specimen; head and thorax pale fuscous, abdomen yellowish-fuscous. Forewings bright ochreous yellow with pale fuscous on basal half of costa and generally along inner margin; fuscous-margined silvery-white spots forming two parallel series from near apex to inner margin, with two larger angulate markings towards base of wing; there is a series of semi-lunate marginal fuscous marks between the veins along outer margin. Hindwings bright ochreous yellow, almost orange in colour on costa, along outer margin, and on veins, with infuscations between the veins; traces of three outer-marginal fuscous spots. Wings below generally fuscous tinged with ochreous along margins and at base of hindwing. Wing length 34 mm., expanse 75 mm.

*Loc.* Western Australia. Type, a male, in British Museum (labelled W. Australia, G. C. Shortbridge, 1906-293).

In the key previously published, Tindale (1935, p. 283), this species falls close to *O. poeticus*, although the general appearance is strikingly different, showing, instead of the mixed brown and ochreous colours, a rather uniformly



Fig. 25. *Oxycanus armatus* Tindale, Western Australia, outline of tegumen, and of eighth sternite.

yellow background tint on the forewings and also infuscated hindwings instead of plain reddish-ochreous ones.

The male genitalia differ in the shape and size of the posterior lobe of the tegumen. In *O. poeticus* this is large and subcircular with a margin only feebly serrated, whereas in *O. armatus* this posterior lobe is small, longer than wide, and armed with two large and a series of seven smaller seriate spines (fig. 25).

#### OXYCANUS SORDIDUS (Herrieh-Schaeffer)

##### Plate xxxii, fig. 8

An extreme form of this species with the silvery markings greatly expanded was taken by Mr. Charles McCubbin at Langwarren, Victoria, in early May, 1947, and through the courtesy of Mr. Nigel Quick I have examined a further series of 10 males and 3 females taken together on 10 May, 1947, ranging from a light brownish-ochreous form without markings on the forewing to the silvery extreme form.

The last named form superficially resembles *O. stellans*, but the base of abdomen and hindwings are almost crimson and the same wings are distally often a dingy gray. The markings of forewings are differently disposed. The tegumen is of typical *O. sordidus* form and readily distinguishable from *O. stellans* by the longer principal spine on the tegumen, the margin of which is shorter than in *O. stellans*.

Three similar examples were taken by Mr. David Holmes at Red Hill, Victoria, on 25th May, 1952. Plate xxxii, fig. 8, shows one of his examples expanding 71 mm. In this the forewings, base of hindwings and body are flushed with a dull reddish-colour, becoming paler towards margins of wings. The silvery markings are widely expanded and edged and lined along veins with dull brown.

## SUMMARY

This paper describes and figures fifteen new *Oxycanus* moths of the family Hepialidae from New Guinea, and also three new species from Australia. The status and synonymy of eight previously described New Guinea species is discussed.

## EXPLANATION OF PLATES

## PLATE XXVI

- Fig. 1. *Oxycanus rileyi* Tindale, male, Dohunsehik, type.  
 Fig. 2. *Oxycanus subochracea* (Joicey and Talbot), male, Wandammen Mts., November.  
 Fig. 3. *Oxycanus subochracea* (Joicey and Talbot), male, Wandammen Mts., November.  
 Fig. 4. *Oxycanus thoe* Tindale, male, Wassior, July, type.  
 Fig. 5. *Oxycanus thasus* Tindale, male, Fak Fak, December, type.  
 Fig. 6. *Oxycanus serratus* Tindale, male, Wondiwoi, July, type.  
 Fig. 7. *Oxycanus salmonacea* (Rothschild and Jordan), male, Angabunga River.  
 Fig. 8. *Oxycanus hebe* Tindale, male, Fak Fak, type.

## PLATE XXVII

- Fig. 1. *Oxycanus tamsi* Tindale, male, Mt. Goliath, February, type.  
 Fig. 2. *Oxycanus tamsi* Tindale, male, Mt. Goliath, January, paratype.  
 Fig. 3. *Oxycanus tamsi* Tindale, male, Mt. Goliath, February, melanic form.

## PLATE XXVIII

- Fig. 1. *Oxycanus dives* Tindale, male, Mt. Kunupi, type.  
 Fig. 2. *Oxycanus dives* Tindale, male, ochreous brown form, Mt. Kunupi.  
 Fig. 3. *Oxycanus dives* Tindale, male, white-streaked form, Mt. Kunupi.  
 Fig. 4. *Oxycanus dives* Tindale, male, form with markings suppressed, Mt. Kunupi.  
 Fig. 5. *Oxycanus hecabe* Tindale, male, Hunsteinspitze, February-March, type.  
 Fig. 6. *Oxycanus hecabe* form *lethe* Tindale, male, Hunsteinspitze, August, type.

## PLATE XXIX

- Fig. 1. *Oxycanus zois* Tindale, male, Dohunsehik, June, type.  
 Fig. 2. *Oxycanus zois* Tindale, male, Angi Lake, June.  
 Fig. 3. *Oxycanus albostrigata* (Rothschild), female, Bolauberg, inland from Huon Gulf, type.  
 Fig. 4. *Oxycanus eos* Tindale, male, Cyclops Mts., type.  
 Fig. 5. *Oxycanus postflavida* (Rothschild), male, Carstensz Peak, type.  
 Fig. 6. *Oxycanus fuliginosa* (Rothschild), probably a male, Carstensz Peak, type.  
 Fig. 7. *Oxycanus salmonacea* (Rothschild and Jordan), male, Angabunga River, type.

## PLATE XXX

- Fig. 1. *Oxycanus meeki* (Viette), male, Biagi.  
 Fig. 2. *Oxycanus meeki* (Viette), male, Biagi.  
 Fig. 3. *Oxycanus thoe* Tindale, male, Wassior, July, paratype.  
 Fig. 4. *Oxycanus discipennis*, Tindale, male, Mt. Siwi, May, type.  
 Fig. 5. *Oxycanus atrox* Tindale, male, Buntibasa, August, type.  
 Fig. 6. *Oxycanus atrox* Tindale, male, Buntibasa, August.  
 Fig. 7. *Oxycanus albostrigata* (Rothschild), male, Rawlinson Mts., allotype.  
 Fig. 8. *Oxycanus albostrigata* (Rothschild), female, Rawlinson Mts.

## PLATE XXXI

- Fig. 1. *Oxycanus mayri* Tindale, male, Mt. Siwi, May, type.  
 Fig. 2. *Oxycanus mayri* Tindale, male, white-streaked form, Mt. Siwi, May.  
 Fig. 3. *Oxycanus perplexus* Tindale, male, Ninay Valley, form without white streak.  
 Fig. 4. *Oxycanus perplexus* Tindale, male, Ninay Valley, type.

## PLATE XXXII

- Fig. 1. *Oxycanus glauerti* Tindale, male, Western Australia.  
 Fig. 2. *Oxycanus glauerti* Tindale, male, Western Australia.  
 Fig. 3. *Oxycanus glauerti* Tindale, female, Western Australia.  
 Fig. 4. *Oxycanus glauerti* Tindale, female, Western Australia.  
 Fig. 5. *Oxycanus kochi* Tindale, male, Australia, type.  
 Fig. 6. *Oxycanus kochi* Tindale, female, Australia, allotype.  
 Fig. 7. *Oxycanus armatus* Tindale, male, Western Australia, type.  
 Fig. 8. *Oxycanus sordidus* (Herrich-Schaeffer), male, silvery-white marked form, Red Hill, Victoria.